

REMARKS

In response to the Office Action mailed July 26, 2004, Applicants respectfully request reconsideration. To further the prosecution of this Application, Applicants submit the following remarks, have canceled claims and have added new claims. The claims as now presented are believed to be in allowable condition.

Claims 1-29 were pending in this Application. By this Amendment, claims 10-11, 21 and 28-29 have been canceled. Accordingly, claims 1-9, 12-20 and 22-27 are now pending in this Application. Claims 1, 20 and 24 are independent claims.

Preliminary Matters

First, Applicants wish to point out that Applicants submitted an IDS on July 27, 2004 after the Patent Office mailed the current Office Action. Applicants respectfully request that the Examiner complete the PTO-1449 contained within that IDS and return that PTO-1449 form with the next correspondence from the Patent Office.

Second, Applicants wish to point out that Applicant have amended the Attorney Docket Number. The new Attorney Docket Number is EMC04-48(01102).

Third, Applicants wish to point out that all future correspondences should be sent to Applicants' Representative at the address below:

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Applicants will be submitting a POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO together with a statement under 37 CFR 3.73(b) (Form PTO/SB/96 or equivalent) in compliance with 37 CFR 1.31 and 1.33 shortly.

Rejections under §102 and §103

Claims 1-7 and 10-29 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,805,787 (Brant et al.). Claims 8-9 were rejected under 35 U.S.C. §103(a) as being unpatentable over Brant et al. in view of U.S. Patent No. 6,078,498 (Eckard et al.).

Applicants respectfully traverse the rejections of claims 11 and 29 and request reconsideration. In order to further the prosecution of this Application, Applicants have included the limitations of these dependent claims into respective independent claims from which the claims depended. In particular, Applicants have amended claim 1, from which claims 10 and 11 depended, to include all of the limitations of claims 10 and 11 and then canceled claims 10 and 11. Similarly, Applicants have amended claim 20, from which claim 21 depended, to include all of the limitations of claim 21 and also claim 11 and then canceled claim 21. Additionally, Applicants have amended claim 24, from which claims 28 and 29 depended, to include all of the limitations of claims 28 and 29 and then canceled claims 28 and 29. Applicants have not raised any new issues that require further searching and/or consideration since, in general, Applicants have simply moved limitations from dependent claims into the independent claims. The claims are in allowable condition.

Brant presents a hierarchy of various contemporary storage configurations in order of highest cost but fastest performance first and lowest cost but slowest performance last (column 5, lines 11-15). For example, a disk based disk cache is listed as being lower in the hierarchy vis-à-vis registers of a microprocessor, but higher in the hierarchy vis-à-vis optical, tape and/or library storage (column 5, lines 16-28). In connection with the hierarchy of contemporary storage configurations, Brant mentions certain RAID approaches, e.g., that RAID3 is supported with daughter cards with flow through parity generators (column 5, lines 29-45).

In connection with the Brant invention, Brant discloses a host 10 in bidirectional communication with a controller 20 of a disk based disk cache subsystem 16 via a link 11 (column 5, lines 51-53 and Fig. 1). The controller 20 employs its own buffer to interface with a separate disk based disk cache array 22 (column 5, lines 54-56). The

Brant controller 20 can include independent paths to write data to its memory in a mirrored fashion so that data is protected against loss (column 5, lines 59-60). A high volume data storage subsystem 25 follows the controller 20 and the array 22 (column 6, lines 3-19 and Figs. 1 and 2).

Eckerd discloses a disc drive 100 having a top cover and a base deck 102 (column 3, lines 17-25 and Fig. 1). Eckerd then mentions a variety of form factor details (column 5, lines 16-30).

Claims 1-9 and 12-19

As mentioned above, Applicants respectfully traverse the rejection of claim 11 which depended from claims 1 and 10, and respectfully request reconsideration. In order to further the prosecution of this Application, Applicants have amended claim 1 to include all of the limitations of claims 10 and 11 and then canceled claims 10 and 11.

Claim 1, as amended, is directed to a data storage device which includes more than two disk drives having platter sizes less than 3.5 inches in diameter, and a controller that accesses the disk drives in response to received I/O requests. The controller simultaneously performs at least a part of at least two write operations onto the disk drives in response to at least two different write requests. The controller is configured to implement a RAID scheme. The RAID scheme is independent of a hierarchically higher RAID controller that sends the data storage device RAID data.

Brant does not teach a data storage device having a controller configured to implement a RAID scheme that is independent of a hierarchically higher RAID controller that sends the data storage device RAID data, as recited in claim 1. Rather, Brant discloses a controller 20 of a disk based disk cache subsystem 16 followed by a high volume data storage subsystem 25 (e.g., see column 5, line 51 through column line 19 and Fig. 1 of Brant). Even if one were to argue that Brant imposed a first RAID approach on the controller 20 and disk based disk cache subsystem 16, and a second RAID approach on the high volume data storage subsystem 25, there is still no hierarchically higher RAID controller as recited in claim 1. This distinction will now be explained in further detail.

As explained in the Specification, for example, on page 8, line 20 through page 9, line 26, a hierarchically higher RAID controller offers a "RAID within a RAID" approach. For example, as shown in Fig. 7 of the Specification, the RAID controller 116 applies a first RAID scheme to the storage devices 100a, ... 100n which includes a storage device 106. Within the storage device 106, another controller applies a second RAID scheme. Accordingly, the controller within the storage device 106 applies a RAID scheme which is independent of a hierarchically higher RAID controller that sends the data storage device RAID data, as recited in claim 1. There is no disclosure of this hierarchically higher RAID controller mechanism in Brant. Moreover, Eckerd, which was cited by the Office Action in connection with claims 8 and 9, does not teach or suggest how one could modify Brant along these lines.

For the reasons stated above, claim 1 patentably distinguishes over the cited prior art, and the rejection of claim 1 under 35 U.S.C. §102(b) should be withdrawn. Accordingly, claim 1 is now in allowable condition.

Because claims 2-9 and 12-19 depend from and further limit claim 1, claims 2-9 and 12-19 are in allowable condition for at least the same reasons.

Claims 20 and 22-23

As mentioned above, Applicants respectfully traverse the rejection of claim 11 which depended from claims 1 and 10, and respectfully request reconsideration. In similar fashion to further the prosecution of this Application, Applicants have amended claim 20 to include all of the limitations of dependent claim 21 and claim 11, and then canceled claim 21.

Claim 20, as amended, is directed to a data storage system which includes at least one first data storage device having a platter size of at least 3.5 inches in diameter, and at least one second data storage device. Each second data storage device includes a device interface for receiving input/output (I/O) requests, a first controller configured to receive I/O requests from the interface, and more than two disk drives coupled to the controller, the disk drives having platter sizes less than 3.5 inches in diameter, where said first controller simultaneously performs at least a part of at least

two write operations onto said more than two disk drives in response to at least two different write requests, wherein the first controller is configured to implement a RAID scheme, and wherein the RAID scheme is independent of a hierarchically higher RAID controller that sends the data storage device RAID data. The system further includes a second controller, as the hierarchically higher RAID controller, that coordinates data access to the at least one first data storage device and the at least one second data storage device.

The cited prior does not disclose a data storage system having a storage device which includes a first controller configured to implement a RAID scheme which is independent of a hierarchically higher RAID controller that sends the data storage device RAID data, as recited in claim 20. To the contrary, as mentioned above in connection with claim 1, Brant discloses a controller 20 of a disk based disk cache subsystem 16 followed by a high volume data storage subsystem 25 (e.g., see column 5, line 51 through column line 19 and Fig. 1 of Brant).

Accordingly, claim 20 patentably distinguishes over the cited prior art for at least the same reasons as claim 1. Thus, the rejection of claim 20 under 35 U.S.C. §102(b) should be withdrawn and claim 20 is now in allowable condition.

Because claims 22-23 depend from and further limit claim 20, claims 22-23 are in allowable condition for at least the same reasons.

Claims 24-27

As mentioned above, Applicants respectfully traverse the rejection of claim 29 which depended from claims 24 and 28, and respectfully request reconsideration. In order to further the prosecution of this Application, Applicants have amended claim 24 to include all of the limitations of claims 28 and 29 and then canceled claims 28 and 29.

Claim 24, as amended, is directed to a method of servicing input/output (I/O) data access requests at a data storage device. The method includes receiving I/O requests at a device interface of the data storage device, wherein receiving an I/O request comprises receiving an I/O request from a hierarchically higher RAID controller. The method further includes accessing more than two disk drives having platter sizes

less than 3.5 inches in diameter in response to received I/O requests, wherein accessing the more than two disks comprises accessing the more than two disks in accordance with a RAID scheme. The method further includes simultaneously performing at least a part of at least two write operations onto the more than two disk drives in response to at least two different write requests.

The cited prior does not disclose a method which includes receiving an I/O request including receiving an I/O request from a hierarchically higher RAID controller. To the contrary, as mentioned above in connection with claim 1, Brant discloses a controller 20 of a disk based disk cache subsystem 16 followed by a high volume data storage subsystem 25 (e.g., see column 5, line 51 through column line 19 and Fig. 1 of Brant).

Accordingly, claim 24 patentably distinguishes over the cited prior art for at least the same reasons as claim 1. Therefore, the rejection of claim 24 under 35 U.S.C. §102(b) should be withdrawn and claim 24 is now in allowable condition.

Because claims 25-27 depend from and further limit claim 24, claims 25-27 are in allowable condition for at least the same reasons.

Conclusion

In view of the foregoing remarks, this Application should be in condition for allowance. A Notice to this affect is respectfully requested. If the Examiner believes, after this Amendment, that the Application is not in condition for allowance, the Examiner is respectfully requested to call the Applicants' Representative at the number below.

Applicants hereby petition for any extension of time which is required to maintain the pendency of this case. If there is a fee occasioned by this Amendment, including an extension fee, that is not covered by an enclosed check, please charge any deficiency to Deposit Account No. 50-0901.

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If the enclosed papers or fees are considered incomplete, the Patent Office is respectfully requested to contact the undersigned collect at (508) 366-9600, in Westborough, Massachusetts.

Respectfully submitted,



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